NOTES AND LITERATURE.

PHYSICS.

A First Course in Physics.[1] — These two books outline a thoroughly substantial course in elementary physics. They are obviously intended to be used together, but each is complete in itself and either (preferably the laboratory manual, as the authors themselves say in their preface) could be used alone as the basis of a shorter course.

The essential feature of these books is their emphasis on the necessity of showing a student "the hows and whys of the physical world in which he lives" as well as the "how much" to which the reaction from "the superficial, descriptive physics of thirty years ago" has led us. For this reason, a great number of devices which are in common use are explained with the help, in many cases, of admirable diagrams of actual machines; as examples we may mention platform scales for wagons, gas meters, two kinds of hydraulic elevators, the fire engine, the railroad locomotive, hydraulic and steam turbines and gas engines, artificial-ice and liquid-air machines, an excellent discussion of the modern methods of heating and ventilating houses, a full description not only of the instruments used in telegraphy and telephony, including the carbon transmitter, but also of the circuits themselves, including even the new Bell central-battery system of telephony, automatic signals and all, three pages of musical instruments, the Zeiss binocular and, of course, wireless telegraphy. In the present instance, the introduction of these illustrative digressions is governed by so just a sense of proportion, and they are handled so well and are backed by so much thoroughly good physics of a more quantitative sort, that the result is much to be commended. It should always be remembered, however,— this is to be taken not as a criticism but as a warning — that this sort of thing may very easily become, in the hands of authors and especially of teachers less scholarly than Professor Millikan and Dr. Gale, an unfortunate return to the old-fashioned superficial, descriptive "natural philosophy" which they themselves so definitely deplore.

[1] Millikan, Robert Andrews and Gale, Henry Gordon, *A First Course in Physics*. Boston, Ginn & Co., 1906. 8vo, viii + 488 pp.

Millikan, R. A. and Gale H. G., *A Laboratory Course in Physics, for Secondary Schools*. Boston, Ginn & Co., 1906. 8vo, x + 134 pp.

Another interesting feature of these books is the free use which is made in qualitative explanations of such conceptions as the kinetic theory of gases, the ionic theory of electrolytic conduction, and the wave front in geometrical optics. Whether or not it pays, for instance, to displace the old ray-optics, which must, of course, be properly interpreted, by the more valuable but also more difficult notion of the wave front, is a question of pedagogy which each teacher must decide for himself. Fortunately the treatment of the most dangerously spectacular part of our modern physics is confined to the last twelve pages of the text-book, where there is an account, admirable as regards both interest and conservatism, of vacuum tube phenomena and of radio-activity, including some of the evidence for the existence of electrons, together with brief statements of the corpuscular theory of matter and of the disintegration theory of radio-activity.

Many other features, while not unique, are nevertheless worthy of much praise. For instance, the experiments, both for the laboratory and for the lecture room, are ingeniously simple and yet, so far as one can judge without trying them, entirely effective.

The typography is good, and the illustrations are most excellent, both in technique and in conception; and the sixteen full-page half-tones of eminent physicists, each with a short paragraph describing the man's life and work, are a notable addition not only to the attractiveness but to the real value of the books.

H. N. D.

BIOLOGY.

Jennings' Behavior of the Lower Organisms.[1]— It is now nearly a decade since Professor Jennings published his first brochure on the reactions to stimuli in unicellular organisms. The intervening period has been one of continuous activity on his part in the study of animal behavior, especially among the lower organisms. His investigations have not been strictly confined to the Protozoa for among the score or more of titles of important contributions from his

[1] H. S. Jennings. *Behavior of the Lower Organisms.* Columbia University. Biological Series, New York, The Macmillan Co., 1906, 8vo, xiv+366 pp., illus. $3.00.